STAT

THE TIBILISSI CENTRAL SEISMOLOGICAL STATION AND THE CAUCASIAN SEISMIC NETWORK.

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This monograph is by Senior Scientific Associate of the Institute of Physics and Geophysics, Academy of Sciences of Georgian SSR Docent A. D. Tskhakaya. It describes the historical development of one of the oldest scientific institutions in the Georgian SSR. The author, who is one of the more important workers at the station, renders an excellent account of the work conducted at the station and of the part played by the station in the development of the Seismological network in the USSR.

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On 17 June 1889 and 28 July 1889 seismological stations at Potsdam and Wilhelmshafen, respectively, registered earthquakes whose epicenters were in Japan. This event may be considered as the cause for the establishment of seismometry as an independent field of scientific study. In 1892 the Marine Observatory at Nikolayev instituted observations over terrestrial movements with the aid of a Reber-Pashvits instrument. In 1893 at the Khar'kov University Observatory two pendulums were installed on N-S and E-W axes. During the period 1893 to 1897 the following five seismic stations in Europe were conducting observations with Rebér-Pashvits equipment: Khar'kov, Nikolayev, Wilhelmshaven, Potsdam and Strasbourg. In 1897 a sixth station started operations at Yur'yev.

In 1898, S. V. Glasek, Director of the Tiflis Physics Observatory and P. P. Kul'berg were able to convince the Managing Committee, Caucasian Branch of Russian Geographical Society that additional equipment was needed at the Tiflis Physics Observatory. The Committee allowed a budget of 1200 rubles for the purchase of a horizontal pendulum

However there was still no Russian organization charged specifically with the mission of conducting regular studies of earthquakes. In 1898 the Russian Academy of Sciences, impressed by the achievements of the Tiflis Physics Observatory formed a Commission for the Institution of Observations over Seismic Phenomena in Russia. On 4 February 1898 this Commission took cognizance over the astronomic observatories at Khar'kov and Yur'yev and the Nikolayev Marine Observatory. Later it recommended the formation of a permanent Seismic Commission within the jurisdiction of the Russian Academy of Sciences. In 1900 this proposal was acted upon and a Seismic Commission was established with representatives from the following organizations: Russian University; Russian Geographical Society; Military Topographical Division, General Staff and the Main Hydrographic Administration. S. V. Glasek, Director of Tiflis Physics Observatory, was also included as a member of the Commission.

One of the first acts of this new Commission was to recommend the establishment of three new seismic stations at Tashkent, Tiflis and Irkutsk. Gradually the importance of seismic observations increased and late in 1900 a regular annual budget of 1400 rubles was appropriated for use by the Tiflis Seismic Station.

Archive records contain observation data of the Tiflis Seismic Station made as early as 6 December 1899, but it was not until January 1900 that regular seismic bulletins were published. The Tiflis Station was established after the construction of the Nikolayev, Khar'kov and Yur'yev stations and was located, then as now, at the Tiflis Observatory. In May 1901 the Tashkent Station began operations and in December 1901 the Irkutsk Station joined the network. The Nikolayev, Khar'kov and Yur'yev stations closed down at a later date, so that the Tiflis Seismic Station - now known as the Tbilisi Central Seismic Station, Academy of Sciences Georgian SSR - became in December 1949 the oldest seismic station in the USSR /Photo of the Tbilisi Station, CIA Graphics Registry No 591137.

Caucasian Second-Class Seismic Station Network

It is significant that no country accepted the importance of seismic observations until the occurrence of some catastrophe. Thus it was only after the 1840 Ararat and 1872 Shemakhinsk earthquakes that Russian science recognized the need for regular observations of seismic phenomena. However it was not until after the 1900 Akhalkalaki earthquake that I. V. Mushketov realized the necessity for establishing a complex seismic network in Caucasia. On 28 October 1900 he recorded his ideas and presented them to the Permanent Central Seismic Commission /PTsSK/ Russian Academy of Sciences in the form of a resolution.

Mushketov, who, along with Professor A. V. Levitskiy, was commissioned by the Ministry of Agriculture and State Resources to make a study of seismic conditions in Caucasia, recommended the establishment of a network of not less than 7 second class stations, to be equipped with Grablovits-Omori horizontal pendula which were to be obtained from a mechanic by the name of Boschat a price of 300 rubles each (two to be purchased by the Ministry and the others by the Russian Geographical Society). Mushketov further recommended that the stations be located at: Vladikavkas, Derbent, Baku, Yerivan, Borzhom, Akhalkalaki, and Batumi.

The proposal was well received and the PTsSK /Permanent Central Seismic Commission/ authorized S. V. Glasek to make preliminary surveys. Because of his efforts and the cooperation of the PTsSK the Tiflis Seismic Station was built in short order and placed in operation.

One serious problem involved the great expenditures necessary for transporting qualified personnel from Petersburg. However, Glasek enlisted the aid of M. R. Zavadovskiy, head of the Caucasian Educational District /Okrug/ who drew up a list of educational institutions which had facilities for training personnel to staff these stations. These educational institutions were the Kirovabad (formerly Yelizavetpol'sk) and Batumi Mens' High Schools and the Pyatigorsk Preparatory School. Glasek reported these facts to the PTsSK and noted further that facilities were being established for seismic stations at the Educational Seminar in Yerivan; at the high school and secondary school in Kutaisi. Preparations were made and money was procured by one means or another. Some of the plans fell through, for example, the seismic station at the Kutaisi Secondary School was never organized. Notwithstanding in the period 1902 to 1909, 9 second-class seismic stations were built /in addition to the Tiflis Central Station/.

These were located at the following places:

Location:	Coordinates:		Height above the Black Sea:
Batumi	41-40N	41-38.35E	3 meters
Shemakha	40-38N	48-38E	710 meters
Akhalkalaki	41-25N	43-29E	1690 meters
Borzhom	41-51N	43-23.08E	794 meters
Derbent	42-04N	48-18E	5 meters below
Baku	40-43N	49-52E	22 meters below
Balakhany	40-27N	49-54.56E	Sea level
Zurnabad	40-31N	46-16E	860 meters
Pyatigorsk	44-03N	43-05E	Sea level

Batumi Station

This station, as well as several others in Caucasia, went into operation during the latter part of 1900. It was initially planned to establish this station at the Batumi High School, but Glasek was of the opinion that this location did not possess sufficient advantages. Glasek then conferred with the Commandant, Batumi Fort, and received permission to set up his equipment in a dry cellar of Mikhaylovskiy fort, and a staff officer was detailed to operate the seismograph. This station went into full operation on 14 September 1902. Among the equipment was a Bosch-type Strasbourg heavy pendulum which on 22 September 1902 at 0500 Tiflis time, for the first time recorded a Middle Asiatic earthquake. This station, however, did not operate for long and was closed down on 19 November 1910.

Shemakha Station

This station was opened on 4 November 1902, in an area which was believed to be near the epicenter of a large majority of earthquakes. This station was equipped with two Bosch-type pendula, installed on N-S, and E-W axes. The operation of this station was under the direction of T. D. Mamaladze, Inspector for the City Schools.

In 1911 a special building was constructed to house the Shemakha Seismic Station. In 1913 a Golitsyn-type heavy pendulum was installed. It ceased operations during World War I, and was damaged to the extent that it remained inactive for a number of years. No seismic bulletins were issued from Shemakha until 1950, when a new seismic station was built and placed in operation.

Akhalkalaki Station

This station started functioning in 1903. Among its equipment at that time were two Bosch-type heavy pendula placed on N-S and E-W axes. This station remained in operation until 19 January 1910, when by decision of the PTsSK its operations were suspended [operations of the Batumi Station were suspended by that same resolution]. However Glasek was able to convince the PTsSK of the importance of this station, so that at the next meeting of the PTsSK, a proposal was passed to continue the operation of the Akhalkalaki Station located at the Akhalkalaki City School and supervised by Sh. G. Demirchoglyants.

Borzhom Station

This station began operation in April 1903 with two Bosch-type heavy pendula. In 1910 the station purchased a special clock from the Strasser-Rode Company. Subsequently it was decided that the station should study the relationship between the regime of mineral springs and seismic phenomena, with the result that new equipment was acquired. In 1910 authority was granted for the reconstruction of the station so as to make the best possible use of the equipment received in the reequipping operation. This new building was completed in 1911, and at the same time an annual budget of 1500 rubles was authorized as wages for the station's personnel. It is interesting to note that this sum of 1500 rubles was the largest sum expended for wages for any of the nine stations. The station ceased operation during World War I and has not been reopened.

Derbent Station

This station started operating on 24 March 1905 in its location at the Derbent Secondary School. It was equipped with two Beech-type heavy pendula installed on N-S and E-W axes. On 30 January 1910, the PTsSK resolved to shut down this station in view of its proximity to the Shemakha Station, and to transfer its equipment to other stations of the Caucasian network. This station was officially closed on 20 February 1910.

Baku and Balakhany Stations

These two stations were organized in June 1903, the Baku Station at Chernyy Gorod and the Balakhany Station at an oil field. S. B. Sharb installed Zelner-Repsold type horizontal pendula with optical recording at both of these stations. At Baku these pendula were installed on N-40°E and N-50°W azimuths. Local geologists manned the equipment installed at the Baku and Balakhany Stations. Observations of the Baku Station for June, July and August 1906 were sent to Yur'yev where the data was analyzed by O. V. Levitskiy and published. From October 1906 to December 1907 observations of the Baku Station were published in the "Monthly Seismic Bulletin of the Tiflis Physical Observatory". Balakhany Station observations were also published in the above bulletin starting in 1907. In addition this latter station in 1906 started issuing "Wochentliche Erdbebenberichte der Seismographischen Doppelstation Villa Petrolea - Balachany bei Baku (Weekly Earthquake Notices of the Seismographic Station at Villa Petrolea-Balakhany near Baku).

However observations at Baku and Balakhany were unsatisfactory in view of poor administration and inadequate equipment.

In 1907 the PTsSK took cognizance of a gradually worsening situation and assigned K. K. Matveyev, a recent graduate of the St. Peterburg University, to take over the affairs of the Baku and Balakhany seismic stations. He was at first temporarily assigned to the seismic station at the Yur'yev

Astronomical Observatory to become acquainted with procedures. After some studies under Professor G. V. Levitskiy, Matveyev on 1 February 1908 assumed control of the two stations. Matveyev soon placed the operations of the Baku and Balakhany stations on an efficient basis, but for some unknown reason was shortly removed as director of the two stations and thereafter served only in a minor advisory capacity to the PTeSK.

The management of the two stations was then vested in Rangol'in, a graduate of the Physico-Mathematical Faculty, Helsinki University, who had served a period of apprenticeship under B. B. Golitsyn.

In 1911 Rangol'in went abroad and on 1 May 1912, Ye. I. Byus was elected to the directorate of these two stations. Byus had completed a course at the Yur'yev University and had received a degree of Candidate of Physico-Mathematical Sciences. In addition he had studied under Professor A. Ya. Orlov at the Yur'yev seismic station. Byus was an enthusiastic worker and soon developed an improved version of a Golitsyn-type vertical seismograph with galvanometric recording. For the period 1912 to 1916 he published a "Weekly Seismic Bulletin". Byus also carried out considerable scientific research work. His greatest contribution was the compilation of an equi-distance map for Baku.

World War I caused the stations to cease operations, but the Baku station was placed in operation again in 1923.

Zurnabad Station

In October 1908, two Bosch-type heavy pendula were installed at this station. The station was originally built on the grounds of the [Zurnabad] Anti-Plague Station. On 22 July 1912 the Bosch pendula were replaced by two heavy horizontal pendulums with magnetic damping and mechanical recording developed by B. B. Golitsyn. The station also acquired an astronomical clock with a second hand manufactured by the Strasser-Rode Company.

During World War I, the station ceased operations, and today [1959] the buildings originally intended for the seismic station, are back under the management of the Anti-Plague Station being utilised in a manner inconsistent with their original intent and purpose.

Pyatigorsk Station

During the early part of 1909 the personnel component for this station completed seismographic training in Peterburg. The building for the station was equipped by the middle of 1909, but it was not until 6 October 1909 that the station went into operation. The station was equipped with two horizontal Zelner-type pendula with magnetic damping and mechanical registration. The work was temporarily interrupted in May 1912, because of construction work necessary for the installation of two new Golitsyn-type seismographs. These were purchased by the Administration for Caucasian Mineral Springs. Observation data was published in the "Bulletin ITsSK". Time service for this station was provided by telegraph from the Tiflis Physical Observatory.

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Accurate time service is of prime importance to the efficient operation of a seismic network. During the early history of the seismic network, only the Tiflis organisations had proper and adequate time service based on astronomical observations. A special transit instrument was installed at the Tiflis Physic Observatory which gave time signals with an error of .1 second. However all second-class seismic stations needed accurate time. At one time it was resolved to establish a direct telegraphic hookup between the various stations in the Caucasian area. This proposal was submitted to the Main Administration of Postal and Telegraph Matters, accepted, and soon thereafter Morse equipment was installed at Batumi, Akhalkalaki, Shemakha, Borshom, Derbent, Baku and Pyatigorsk. There was a telephone hookup between Baku and Balakhany. However the time lag presented some

serious difficulties and grave errors appeared in the Tiflis Physical Observatory bulletin due to time differences.

Other difficulties also plagued the operation of the seismic network. Most of the stations were equipped with Bosch-type pendula, while recording was carried out by imperfect equipment.

In addition, during the early period, the supervisors of seismic stations received no regular salary, and heads of educational okrugs were given authority to pay salaries only to those station supervisors whose work was accurate. Therefore in view of the poor equipment it is understandable that in 1901 the total annual wages paid to personnel of the whole network amounted only to 150 rubles.

This latter fact created much dissatisfaction, so that in 1903 the director of the Tiflis Physical Observatory requested and received from the PTsSK a grant of 50 rubles per year each for maintenance work at Borzhom, Akhalakalaki, Shemakha and Batumi. The director of the Tiflis Physical Observatory was also able to convince the chief of the Caucasian Educational Okrug that a grant of 25 rubles per month each should be allowed the personnel of seismic stations.

In July 1903, S. B. Snarke, who was inspecting the Shamakha Seismic Station, suggested a better method for assigning personnel to these stations. He cited the example that the observer at the Shemakha station was at the same time an inspector of the Shemakha City School, thus requiring him to make frequent use of unqualified substitutes.

The general picture of the operation of second-class seismic stations was unsatisfactory. Therefore on 30 January 1910 the PTsSK held a meeting to decide the value of these stations, prior to recommending their dissolution. Eloquent appeals for the retention of the second-class seismic stations were made by S. V. Olasek and O. V. Levitskiy. At the end of the discussions, and notwithstanding strong recommendations by A. Ya. Orlov

and N. I. Pomerantsev for the shutting down of the stations, the PTsSK voted to retain all the stations with the exception of the Derbent station, whose equipment was assigned to the other stations.

Soon thereafter a remodelling program was instituted at Borshom, Zurnabad Shemakha and Pyatigorsk, and all the Bosch-type equipment was replaced by improved Golitsyn-type pendula. In addition at Balakhany there was installed a Zelner-Repsold type optical seismograph.

All this time the Tiflis Seismic Station remained a model of excellent operation, equipped with the latest available equipment. In 1903 it had among its equipment, the following:

1. Reber-Ehlert type seismograph with three horizontal pendula and photographic recording
2. A Kankani-type vertical pendulum
3. Milne-type horizontal pendulum with optic recording
4. Bosch-type heavy horizontal pendula with mechanical recording
5. At a later date a Zelner-type heavy pendulum with mechanical recording.

It appeared that most of the foreign stations had Milne-type seismograms. So as to permit better coordination of data, this type of equipment was also installed at the Tiflis Observatory.

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One of the greatest contributors to the development of seismology in the USSR was Academician B. B. Golitsyn. He developed a new seismic apparatus which by a 10 October 1910 decree of the PTsSK was installed at the Tiflis and Tashkent stations for testing. Today this apparatus is still operating satisfactorily. Golitsyn also developed a horizontal and vertical seismograph with galvanometric recording for use at first-class stations. On 8 October 1910 the PTsSK ordered all first-class stations to acquire Golitsyn-type aperiodic seismographs. The original equipment is still functioning satisfactorily today.

In 1911 two horizontal aperiodic pendula with galvanometric recording were installed at Tiflis on large cement foundations. S. A. Belyayev, an observer at the Tiflis Seismic Station "trued" this, equipment. The deviation data was checked at a later date by S. A. Belyayev with the aid of S. V. Glasek and the instruments were placed on a full continual operating basis on 22 February 1912. The use of this new equipment eliminated the necessity for operating a Reber-Klert type triple horizontal pendulum with optical recording and two Zelner-type horizontal pendula.

Since 1911 the chief observer at Tiflis was S. A. Belyayev, a graduate of the Moscow University. On 1 June 1913 he was relieved by S. V. Shimanovskiy, but continued his work at the station till August 1913.

On 18 September 1913 a new Golitsyn-type aperiodic vertical seismograph was installed and put into operation.

The station operated continually until World War I. The civil war precluded rapid reopening of the station but the 20 February 1920 Gorlkiy earthquake forced opinion in favor of rapid re air and reopening of the station. Notwithstanding it was not until after the start of the Soviet era that the Tiflis Seismic Station renewed continual operations [in 1921 a Golitsyn-type heavy pendulum renewed operation on N-S and E-W axes.]

Seismological observations in Russia were always conducted on a rather haphazard basis. There was no standard reporting form, and bulletins were issued irregularly.

Subsequent to 14 October 1910, the PTsSK realized the importance of greater coordination of effort and appointed an investigating committee composed of G. V. Levitskiy, B. B. Golitsyn (Chairman), A. Ya. Orlov, I. I. Pomerantsev, E. V. Shtelling and P. M. Nikiforov (Secretary). One of the first acts of the committee was to submit a standard report form for the daily bulletins of first-class stations. The form was approved as follows:

$PSLM_1M_2$ S_1S_2Fig $TA_1A_2A_3$ Time

1. Phases

P - initial moment of first phase

S - initial moment of second phase

L - initial moment of the long waves

M_1, M_2 etc - initial moment for 1-st, 2nd etc maximum

S_1, S_2 etc - initial moment of secondary maximums

F - moment of tremor cessation

i - placed before phase to indicate a sharp shock

e - placed before phase to indicate moderate shock

("i" and "e" may also be used independently to indicate that the nature of the phase is undefined).

2. Period and Amplitude

T - period, in seconds

A_E - amplitude on an E-W bearing with deviation of crust in microns from equilibrium

A_N - amplitude on a N-S bearing with deviation of crust in microns from equilibrium

A_Z - amplitude in general in microns from equilibrium.

3. Time GMT.

The field of seismology received its greatest boost with the installation of the Soviet regime. The Tiflis Physics Observatory was renamed the Georgian Geophysical Observatory, and in May 1944 the observatory celebrated its centennial.

In 1921 a Kankani-type vertical pendulum was restored to operation at Tiflis. In September 1926 two Golitsyn-type horizontal aperiodic seismographs with galvanometric recording were reactivated. In 1927 a vertical seismograph was restored, as well as three remaining aperiodic seismographs with galvanometric recording, two Golitsyn-type horizontal heavy pendula with mechanical recording, two Bosch-type horizontal pendula with mechanical recording and another Kankani-type vertical pendulum.

In 1932-33 the Seismological Institute, Academy of Sciences USSR sent two expeditions into the Caucasus, one to Dagestan [the Sulaksk Expedition under S. I. Masarskiy] and the other into the Transcaucasus [Transcaucasian Seismic Expedition under A. D. Takhakaya]. The purpose of the expeditions was to locate the epicenters of seismic activity in the Caucasus. To aid in this study, temporary seismic stations were constructed at Alagir (North Oseta), Gori, Dusheti, Oni and Tbilisi. The expeditions completed work in 1933 and published the results in Volume XII of "Quarterly Seismic Bulletin". It was also resolved to close down the temporary stations which were equipped with highly sensitive short-period seismographs. Alagir and Dusheti were shut down in spring of 1933. The Oni and Gori stations are continuing operations and are being financed by local appropriations. The equipment placed by the expeditions at Tbilissi is continuing its operation.

In November 1933 by decree of the Government of the Georgian SSR and the Presidium, Academy of Sciences USSR, a Geophysics Institute was organized at the Georgian Affiliate, Academy of Sciences USSR. The Tbilisi Seismic Station as well as the regional stations at Oni and Gori were placed within the jurisdiction of the Institute. The work volume of the Tbilisi station increased to the extent that it became the main station in Georgia, and was renamed the Tbilisi Central Seismic Station. Observations of this station have been published regularly since 1935 in the "Quarterly Seismic Bulletin", Volume XIII will be published shortly and will contain data collected since 1945. From 1933, Professor M. Z. Nodia, Director of the Institute of Physics and Geophysics, Academy of Sciences Georgian SSR, has been the chief editor of the quarterly bulletin.

Since the organization of the Geophysics Institute [by 10 February 1941 decree of the Supreme Soviet - Georgian SSR, this Institute was renamed the Institute of Physics and Geophysics, Academy of Sciences Georgian SSR, with several Divisions, among them: Physics and Seismology], there has

not been one earthquake which has escaped the notice of the Seismological Division of the Institute. The Institute has also organised numerous expeditions: Yerevan Expedition on 7 January 1939 with A. D. Tskhakaya, A. G. Nazarov and A. L. Chunayan; Adshikendsk Expedition on 21 December 1938 lead by A. D. Tskhakaya; the Tabatskurskiy Expedition on 8 January 1940 with A. D. Tskhakaya and A. G. Nazarov; the Ambrolaurskiy Expedition on 26 September 1940 lead by T. M. Lebedev; the Gudamakarskiy Expedition on 15 August 1946 with A. D. Tskhakaya and associates of the Institute of Construction Matters, Academy of Sciences, Georgian SSR, Sh. A. Dzhabua, A. N. Safaryan and Sh. A. Napetvaridze and the Ashkhabad Expedition on 6 October 1948 with A. D. Tskhakaya and associates of the Institute of Construction Matters, Academy of Sciences, Georgian SSR, Sh. A. Dzhabua A. L. Chunayan, Sh. G. Napetvaridze, I. A. Gzelishvili and A. N. Safaryan. It is also interesting to note that in all cases, expeditions were sent after particularly heavy earth tremors.

All the data, except that collected by the last expedition, was processed by Ye. I. Byus, T. M. Lebedeva and A. D. Takhakaya. Ye. I. Byus was able to compile a map showing seismic regions in the Georgian SSR.

Currently the Seismological Division, Institute of Physics and Geophysics, is compiling a yearly graph of Caucasian earthquakes. The reports are published in the form of appendances to the "Quarterly Seismological Bulletin". To aid in this compilation program, data is received from the Tbilisi Central Seismic Station and regional seismic stations at Abastumani, Borshom, Gori and Zugdidi. All have seismographs with short periods (2 seconds), optical recording with 2000X magnification.

Some of the basic data for the regional stations under the jurisdiction of the Institute of Physics and Geophysics, Academy of Sciences, Georgian SSR, is as follows:

Abastuman 41°45'18' N, 42°49'03' E altitude 1700 meters.
(Appendix 1 for ground floor plan)

Located on Mt. Kanobili at the Abastuman Astrophysics Observatory, 7 kilometers from the Abastuman Health Resort. It was opened in December 1940 and today (1950) is supervised by N. A. Razmadze. Supervisors at other times have been N. Bashakidze, N. Kalandadze and A. Dzhinchveleyshvili. At all times Professor Ye. K. Kharadze, director of Abastuman Astrophysics Observatory, has done much to facilitate the operation of the station.

Borzhomi-Park 41°50' N 43°23E. altitude 794 meters
(Appendix 2 for floor plan)

Located on the left bank of the Kura River at [illegible] of the grounds of the Borzhom Sanatorium. The building was [illegible] Georgian Health Resort Adm[illegible] and is now [illegible] of the Borzhom [illegible]. It was [illegible] In spite of the fact that the traffic on [illegible] Street [illegible] 90 meters from the instruments) and the [illegible] on the right bank, the vibrations do not [illegible] is about 5 meters above the water level of the [illegible]

The Borzhom station was formerly located in Beymetrov Park but since the construction of a rail line and a railroad station, the activity was injurious to the sensitive instruments with the result that in 1936 the station was moved. Some of the equipment was moved to Tbilisi while the Strasser-Rode clock was shipped to the Zugdidi station where it is still in use. At one time or another the station has been under the supervision of K. V. Ramin, G. Shalamberidze and A. A. Stepanov. Today, A. A. Stepanov, son of the previously mentioned Stepanov, is supervisor of the station.

<u>Gori</u> 41°59' N, 44° 07'E altitude 610 meters

Located in the lowest cellar of a building at 29 Ul. Chelyuskintsev. It has no cabinets or laboratories, but does possess a contact clock with second hand. The Seismological Division, Institute of Physics and Geophysics, and the Institute of Construction Matters, Academy of Sciences Georgian SSR, are considering plans for a new building. The station was opened in November 1933 by the Caucasian Seismic Expedition and then was transferred to the jurisdiction of the Institute of [illegible] and [illegible]. At the present time the supervisor is I. Ayvazov who graduated from the Tbilisi State University with a geophysics specialty. [illegible] supervisors have been V. I. Shakhov, [illegible] G. [illegible], [illegible] and [illegible]

[illegible]

[illegible]

[illegible]

[illegible] 42°59'N, 43°27'E altitude [illegible] meters

Activated in October 19[illegible] by the Caucasian Seismic Expedition. In November 1933 this station was transferred to the [illegible] Physics Institute [Now Institute of Physics and Geophysics]. It is located in a building in Yashvili. Much difficulty was experienced due to lack of qualified personnel. During the period 1933 to 1940 some seven people held the post of supervisor. Moreover it was located away from transportation so that it was difficult to reach. Dissatisfaction with the operation of this station reached such a degree that it was shut down in 1940.

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Tbilisi 41°43'08N, 44°47'42"E altitude 400 meters
(Appendix 4 for floor plan of the station)

This station has always been located in the Georgian Geophysics Observatory and occupies the whole basement. On three sides the building is protected by ground works while the fourth side is open to permit meterological observations. The observatory property abutts the Kura River, and the station is located 90 meters from the bank. It sits back 170 meters from Prospekt (Avenue) Plekhanova. Unfortunately the basement of the river is below the river water level, so that at times the basement became flooded, but in 1948 new drains were installed so that the flooding has been stopped.

The basement was originally heated summer and winter with two furnaces. In 1949-1950, however, there were some improvements to the basement so that today a constant temperature is maintained by a single electric furnace. The floors and walls of the basement have been treated with a water proofing material.

The latest report lists the following equipment at this station:

1. A full inventory of aperiodic seismographs (two horizontal and one vertical with Golitsyn-type galvanometric recording. The recording equipment is operated by a clockwork mechanism, and 30 mm of tape represent the passage of one minute.

2. Two horizontal short-period optical seismographs with oil damping. Magnification is around 2000 times; 30 mm of tape represents the passage of one minute.

3. Two horizontal heavy pendula with Golitsyn-type mechanical recording and magnetic damping. 15 mm of tape represents passage of one minute.

4. Kankani-type vertical pendulum with automatic setting on N-S and E-W axes with mechanical recording. Recording rate is 60 mm of tape per minute, there is no damping and magnification is about 45 times.

5. Bosch-type horizontal seismograph without magnification equipment but with oil damping.

It is planned to install a complete inventory of D. P. Kirnos-type equipment in the very near future.

The comprehensive equipment inventory of the Tbilisi station and the various telesseismic and regional stations permits an accurate check of all earthquakes. Strasser-Rode clocks maintain accurate time, and record power every minute, all synchronisation is accomplished by radio signal from Moscow (dash-dash-dot).

One last item of interest. In the west end of the basement at the Tbilisi Seismic station equipment is available for carrying out gravitational studies. In 1909 a Gecker-type instrument operated in conjunction with a similar instrument at Potsdam. This instrument was in use until 1949 when Abakelin supervised the installation of new equipment in a newly constructed thermo-chamber on which associates of the Institute of Physics and Geophysics conducted gravimetric studies. The Seismological Division of this Institute has been able to compile reports on the seismic characteristics of various points and regions in the Georgian SSR, based on data gathered by the various stations of the seismic network.

The seismic network also serves as a training ground for students in geophysics at the Tbilisi State University and other educational institutions of Tbilisi. Special lectures are organised by the various stations and numerous student groups visit these installations.

Currently the following scientific technical associates of the Institute of Physics and Geophysics are working at the Tbilisi Seismic Station: Ye. I. Ryma, A. D. Tskhakaya, T. M. Lebedeva, I. K. Kokaya, O. Ye. Kartsivadze, V. V. Pavlenishvili, F. F. Veys and N. Lomidze. One of the most promising technicians P. Ceperidse had his achievements cut short by death while in his country's service.

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